INTERMOUNTAIN POWER SERVICE CORPORATION

Engineering Test and Inspection Sheet

Equipment: Burners — Unit # 1 — Test/Inspection Date: April 15, 1994
Inspector: Garry Christensen, Cecil James — Responsible Engineer (Initials): ______

General Notes:

Item or Test	Observations/Comments	Recommendations
E row	Windbox dampers were not tracking together. The west side is almost closed, while the east side is almost 100% open.	Inspect all burners and stabilizers during the next outage. Prepare for the possibility of changing out 10 - 12 stabilizers.
E1	Ignitor end cup missing.	
E2	Stabilizer is starting to blossom.	
E3	Stabilizer is starting to blossom.	
E4	Seized up outer register vanes. Stabilizer too deformed for service, PHOTO 3. Stabilizer replaced.	
E6	Loose outer register shroud. Shroud re-attached with 6½" gap.	
A1, A2, A5, A6	Seized up outer register vanes.	
A3	Stabilizer is starting to blossom.	
F3	Stabilizer is starting to blossom.	
F4, F5, F6	Throat sleeve is cording between retaining clips, PHOTO 4.	
B2	Broken plug weld on outer air shroud.	
B4, B5	Seized up outer register vanes.	
D2	Throat sleeve is cording between retaining clips. The outer register assembly is pushing the throat sleeve out. Seized up outer register vanes.	
D4, D5, D6	Seized up outer register vanes.	
H2	Stabilizer too deformed for service, PHOTOs 5, 6, 7. Stabilizer replaced.	
H3	Stabilizer too deformed for service, PHOTO 8. Stabilizer replaced. Seized up outer register vanes. Nozzle seam weld split approximately 6 inches.	
H4, H5	Stabilizer is starting to blossom.	
H6	Nozzle out of round.	
C1	Seized up outer register vanes.	
C2, C5, C6	Loose outer register shroud. Shrouds reattached with C2: 6-11/16", C5: 6-1/16, C6:6-1/16" air gaps.	
C4	Stabilizer bowed out at bottom, PHOTO 9. Nozzle has dropped and pushes the stabilizer as it expands.	
G2	The weld between the CS barrel and the SS tip has cracked, PHOTO 10. Nozzle has dropped down onto the stabilizer, PHOTO 11.	
G5	Nozzle is out of round and resting on stabilizer, PHOTO 12.	

RJM CORPORATION
Ten Roberts Lane
Ridgefield, CT 06877
(203) 438-6198-Phone
(203) 431-8255-Fax

FACSIMILE TRANSMITTAL COVER SHEET

Please deliver the following pages to:

Name:	Jim Nelson	**Date:**	May 2, 1994
Company:	IPSC	**From:**	Richard J. Monro
Fax No:	801-864-4970	**Proposal No.:**	940502
Reference:	Unit No. 1 Flame Stabilizers		
Transmitting 2 pages (including cover sheet) from Xerox 7032.			

Message:

We have reviewed the photographs of the flame stabilizers which you sent to us. The following action plan may assist in addressing the problems being encountered:

1. Flame Stabilizer Overheating - The distortion and thermal stress patterns on the flame stabilizer along with the ash deposition patterns, indicates the most probable cause of the overheating is due to an over-swirled condition (most likely induced by the outer zone air doors).

   Solution - It is recommended that the air doors be set to a more open position. The outer air door position should be opened in small increments and the fires observed to assure that stability is being maintained. (The aerodynamic stability of the flame stabilizer should permit the outer zone air doors to be open to 100% open position while maintaining stable fires. However, proceed in progressive steps to be on the safe side.)

   It would be helpful to install a thermocouple on the outboard trailing edge of the worst flame stabilizer prior to returning Unit No. 1 to service. The thermocouple can be used to determine air door position versus flame stabilizer temperature for setting purposes.

2. Coal Pipe Ash Deposits - The ash deposits in the coal pipe are consistent with high swirl forcing the adverse static pressure gradient boundary up into the coal pipe. In this position, furnace fly ash would centrifuge out of the adverse static pressure gradient apex and deposit in the coal tube. The phenomenon is identical to mechanical cyclone collectors.

Solution - A full, thermal heat flux, computational fluid dynamics (CFD) model of the burner will be required to solve this problem. Our new, full-graphic modeling program will allow us to follow the location of the apex of the adverse static pressure gradient boundary as air door positions are changed. Hopefully, there is an optimum air door position which avoids the ash deposition problem while maximizing flame stability characteristics. The model will also allow us to examine possible alterations to the primary airflow zone to prevent deposition conditions from occurring.

3. Coal Pipe Distortion - All of the photographs show an overheating pattern, and in 60% of the cases a mechanical distortion of the pulverized coal tube in the vicinity of the flame scanner. We suspect this is due to impingement of the igniter flame on the coal tube at this point. This distortion may be setting up circumferential thermal stresses which are forcing the cracking at the welded seam.

   Solution - Again, the CFD model can be used to examine the impact pattern of the igniter flame envelope on the pulverized coal tube. The model could then be used to explore various solutions.

A full aerodynamic thermal heat flux model, including igniter flame pattern impacts, would cost $20,000 to perform.

We presently have a three-plus-month backlog on modeling, so we could not perform this work immediately. However, opening the air doors in the outer zone incrementally should allow you to achieve the position in which the unit can be safely operated for the interim period. The CFD model can then be used to develop a permanent long-term solution.

RJM/sv

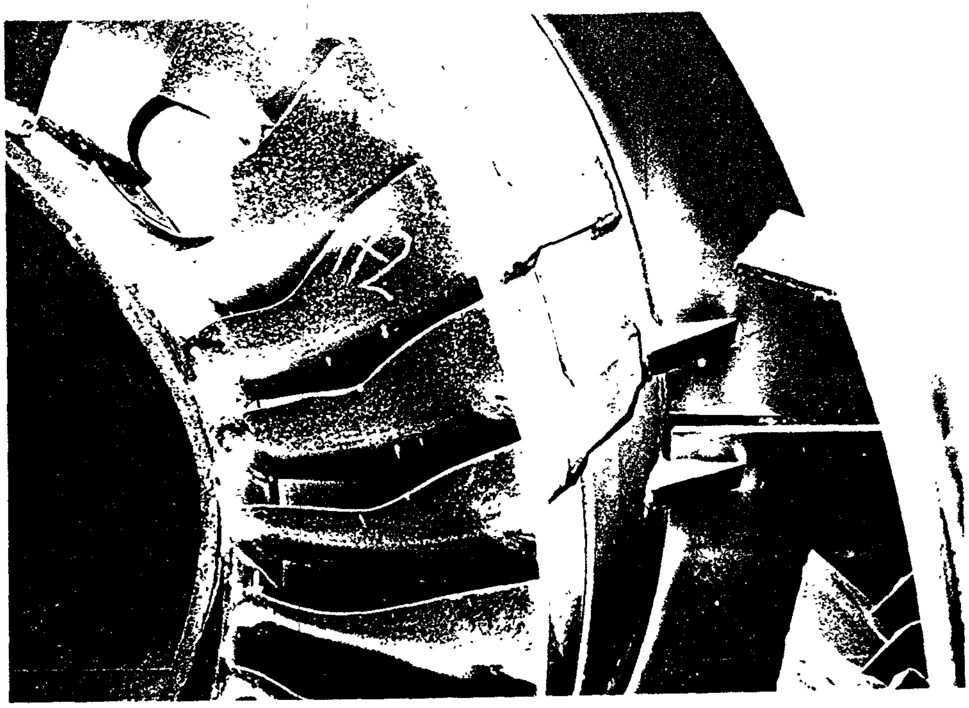

PHOTO 1: Exfoliation and deformation of surfaces having direct radiation from fireball.

PHOTO 2: Formation of ash indicating backdrafting into out of service burners.

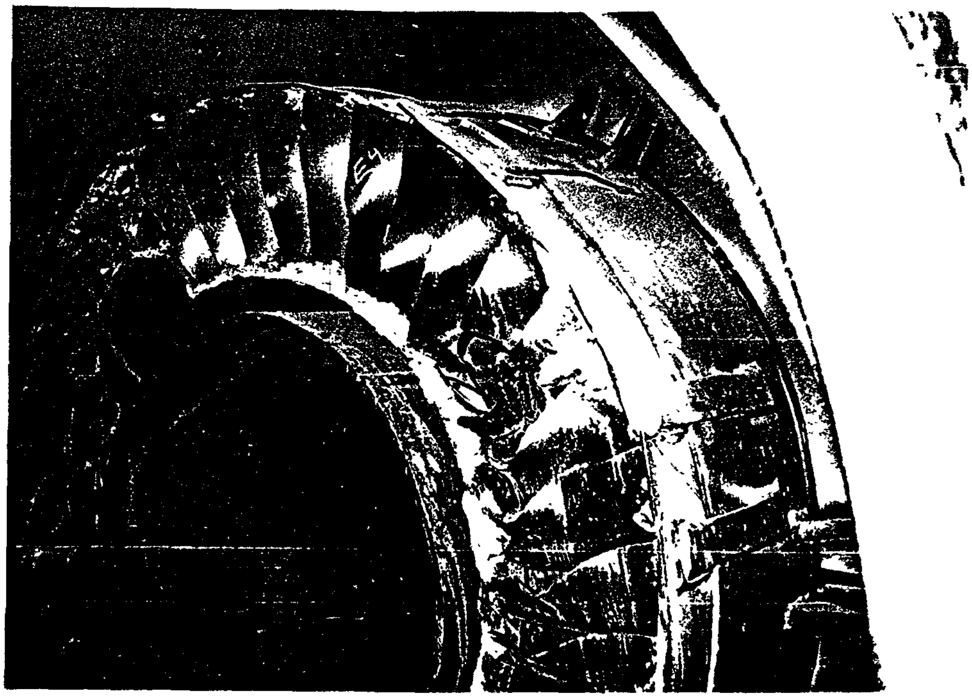

PHOTO 3: E4 stabilizer deformation due to overheating.

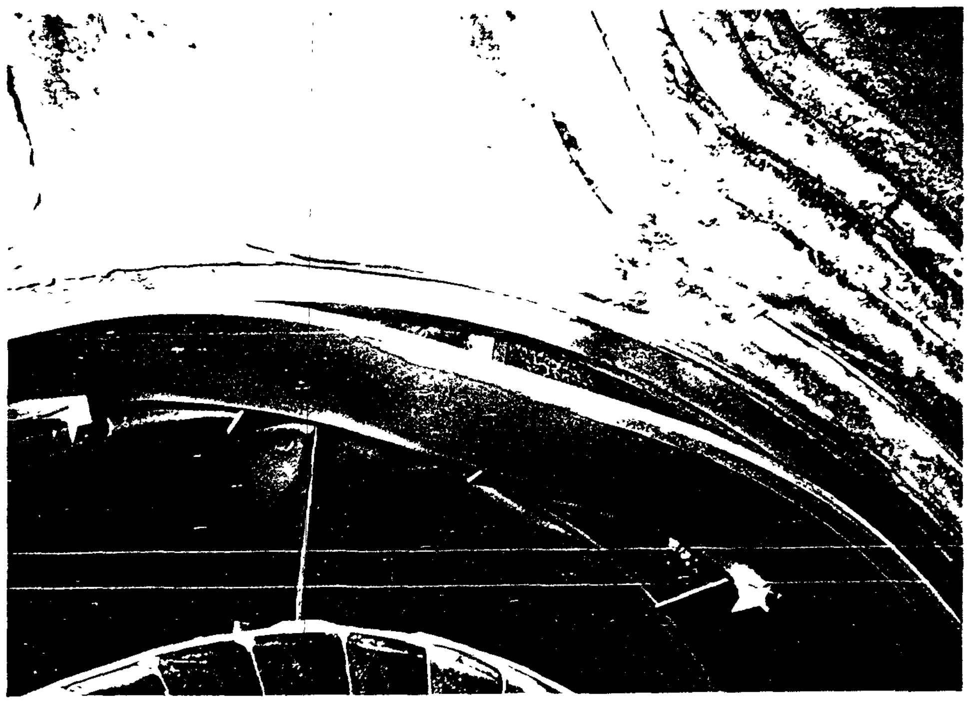

PHOTO 4: Throat sleeve cording between clips permitting air to bypass outer register.

PHOTO 5: Deformation of H2 stabilizer vanes due to overheating.

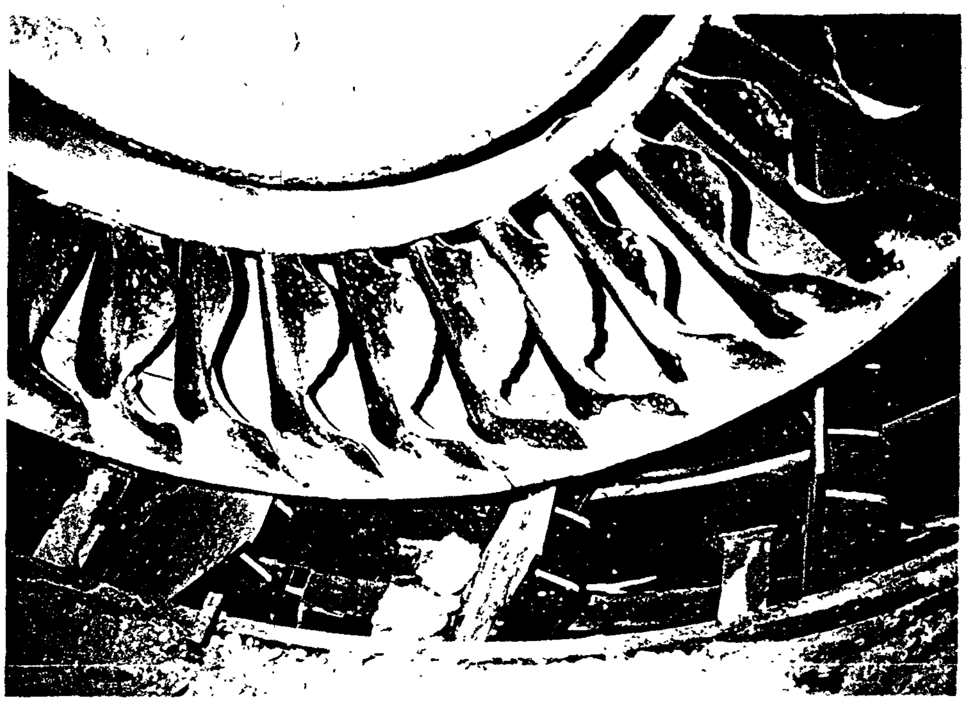

PHOTO 6: Distortion of the H2 stabilizer vanes.

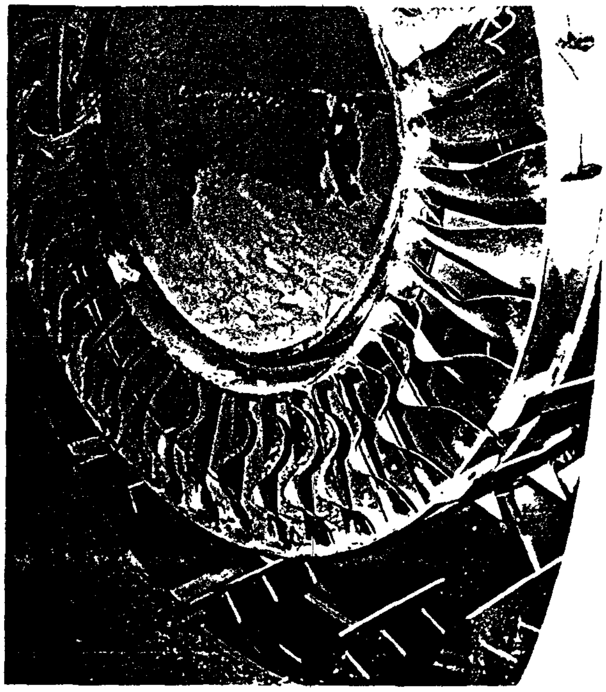

PHOTO 7: Loss of H2 stabilizer functionality due to distortion.

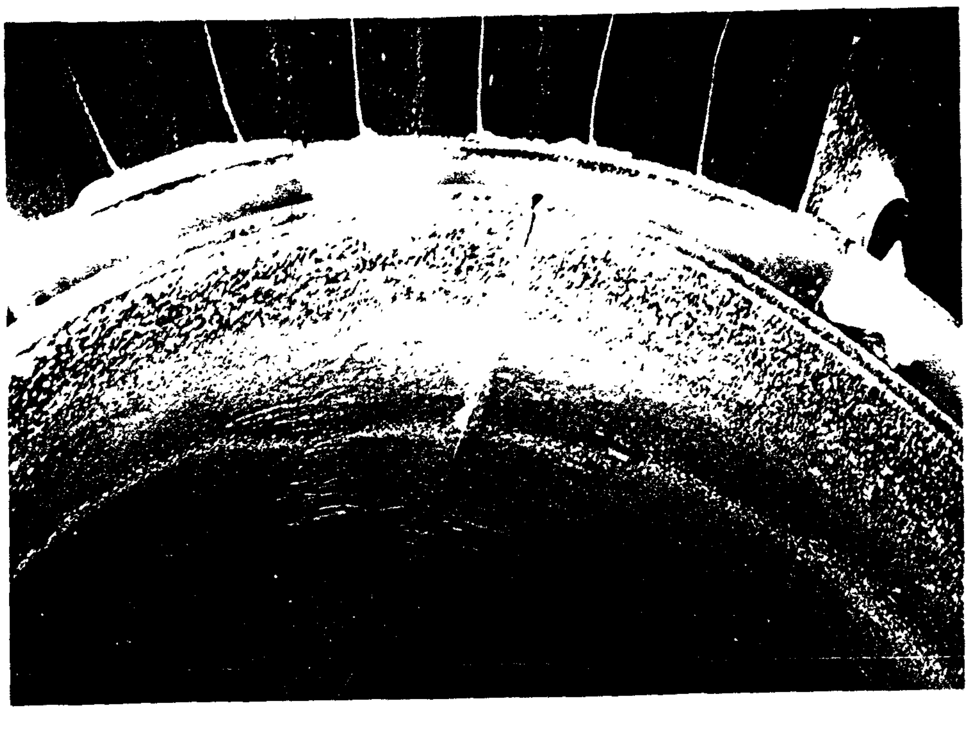

PHOTO 8: Crack in the seam weld of the H3 burner nozzle tip.

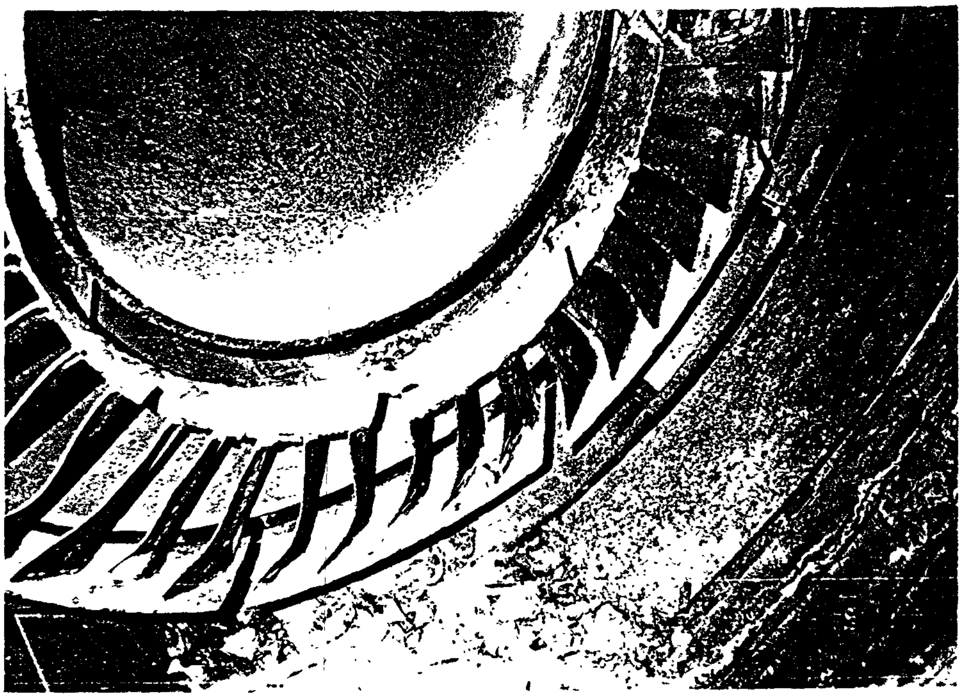

PHOTO 9: C4 stabilizer being pushed out by the nozzle.

PHOTO 10: Crack in the weld attaching the SS nozzle tip to the CS barrel in G2.

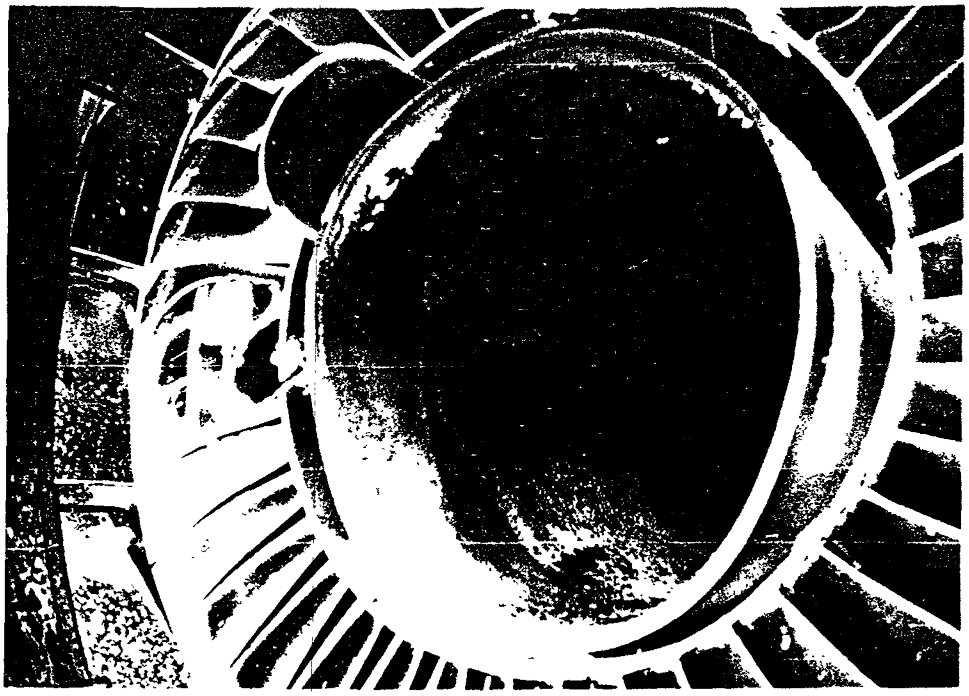

PHOTO 11: G2 nozzle impinging on the stabilizer may eventually cause the same problem seen in photo 9.

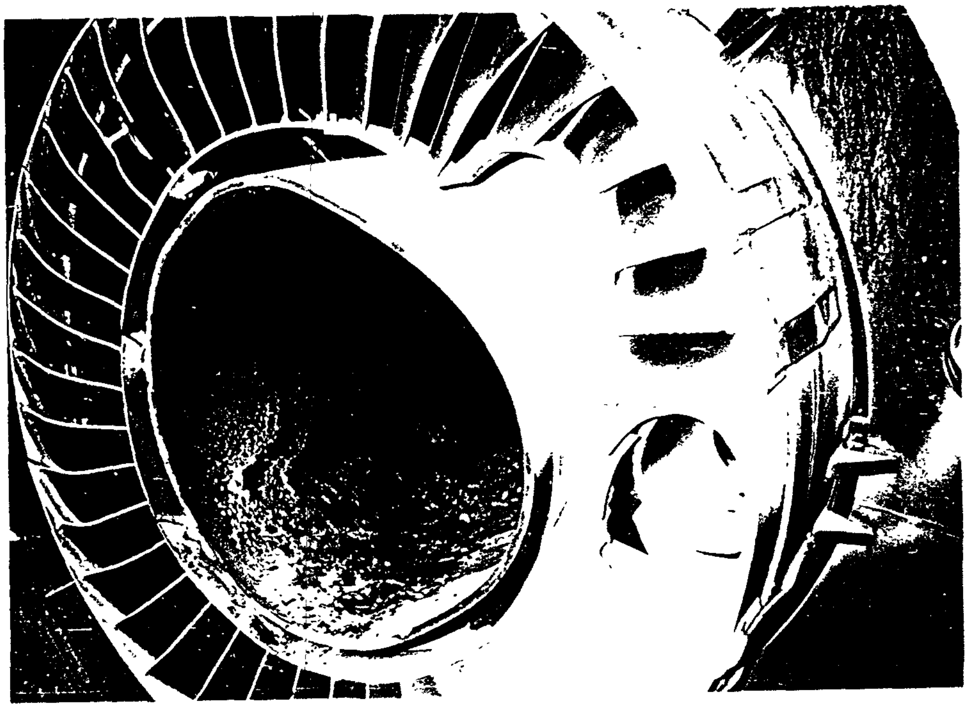

PHOTO 12: G5 nozzle impinging on the stabilizer may eventually cause the same problem seen in photo 9.

RERATING UNITS